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# A comparison of the hybrid kernel and the parallel level-sets approaches for the inclusion of MR information into PET reconstruction

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Since the introduction of integrated hybrid PET/MR scanners, several techniques have been proposed to take advantage of the combined information from the two modalities.
In particular, in this work, we investigate the performance of two different approaches: the hybrid kernelised expectation maximisation (HKEM) algorithm and the parallel level sets (PLS) method.
Both are implemented in the open source Software for Tomographic Image Reconstruction (STIR).
Simulated phantom torso data and real patient data with long and short acquisition times were used to compare reconstructions in terms of bias, Contrast Recovery Coefficient (CRC), and Contrast to Noise Ratio (CNR) using different ROIs to study different case scenarios.
The quantification performances are good for both HKEM and PLS, and both always outperform the ordered subsets expectation maximisation (OSEM) algorithm.
The HKEM shows excellent quantification, noise suppression and edge-preserving results for both long acquisition and short acquisition times.
Results are equally good for PLS with long acquisition times but it is more difficult to fine-tune the parameters for optimal noise suppression with the short acquisition times.

**Primary author:** DEIDDA, Daniel (Biomedical Imaging Science department, Department of statistics, University of Leeds)

**Co-authors:** Dr TSOUMPAS, Charalampos (Biomedical Imaging Science Departmnet, University of Leeds); THIELEMANS, Kris (University College London); Dr KARAKATSANIS, Nicolas (Division of Radio-pharmaceutical Sciences, Department of Radiology, Weill Cornell Medical College of Cornell University); Dr EFTHIMIOU, Nikos (School of Life Sciences, Faculty of Health Sciences, University of Hull); Dr ROBSON, Philip M (ranslational and Molecular Imaging Institute (TMII), Icahn School of Medicine at Mount Sinai); Dr AYKRYD, Robert (Department of Statistics, University of Leeds); Ms TSAI, Yu-Jung (Institute of Nuclear Medicine University College London); Prof. FAYAD, Zahi A (Translational and Molecular Imaging Institute, Icahn School of Medicine at Mount Sinai)

**Presenters:** DEIDDA, Daniel (Biomedical Imaging Science department, Department of statistics, University of Leeds); THIELEMANS, Kris (University College London)

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